That the method of the two cycles would have given approximately correct rainfall variations in the majority of years is obvious, and that the calculated variations (more particularly in the case of Madras alone) should be smaller than the actual variations is not surprising, but the actual and calculated values in some years are so very divergent that it must be reluctantly conceded that it is impossible by this method "to determine beforehand with any certainty the probable amount of rain in any season, such as would admit of timely precautions being taken against impending drought."

[NOTE.—In publishing this important paper by Mr. Dallas promptly, without incurring the great delay that would be necessitated by submitting the proof sheets to him, several matters have been noticed by the Editor which, although unimportant to the general trend of the argument, may possibly be worth repeating as helpful to the reader.

The word "variations" is used by Mr. Dallas always in the same sense as the word "departures" is used by other writers, viz, the observed value minus the computed value, so that a plus variation is also a plus departure.

The adoption of a regular 11-year cycle, instead of the somewhat irregular sun-spot numbers, which are given in Table VIII (inasmuch as the 11-year and the sun-spot cycles depart widely from each other), seems to show that the 11-year period has no direct connection with the sun spots, and it should, therefore, not be spoken of as a sun-spot period, but simply an 11-year cycle.

The pressures given in Table I for three different series of years should, strictly speaking, be reduced to a common system by adopting the years 1853–1896 as the basis. The mean pressures for these forty-four years are: Madras, 29.844; Bombay, 29.813; Calcutta, 29.784; the mean of all three is 29.814. Adopting this latter figure as the base, we reduce each of the three stations to a common standard by applying the corrections, —0.030, + 0.001, + 0.030. Fortunately these corrections are the same as those used by the author in preparing Table IV and Fig. 1.

With regard to the annual pressures for Mauritius, Mr. Dallas states that they were corrected for the 11-year cycle in order to obtain the curve of Fig. 2. We infer that the corrections were specially computed by him from the Mauritius observations, and that he does not mean to say that he corrected the latter by using the means for India given in Table III.

No reason is given for omitting from Tables IX and XI the earliest years, as given in Table VIII.

In Tables X and XII the author has compared together the Madras rainfall and the Indian pressure, but for quite different groups of years. If the comparison had been for a uniform system of stations and of years, the results might have been more harmonious. It is difficult to separate the influence of this discrepancy as to locality and time from the influence of the general want of physical connection between the rainfall and the pressure.

In Tables XIII, XIV, and XV the figures given in the manuscript for the variations of rainfall for all India show some slight discrepancies, viz: XIII, 1886, +3.0; 1887, +2.4; 1889, +2.5; XIV, 1886, +3.2; 1887, +2.4; 1889, +2.4; XV, 1886, +3.2; 1887, +2.6; 1889, +2.4. These discrepancies the Editor has removed, so that the three tables may be harmonious.

With regard to the variations of rainfall at Madras, as given in Table XV, the reader will notice that the figures of column 5 may be reproduced by assuming the normal for Madras at 50.0 inches and computing from this the departures of the individual years given in Table VIII. Two small discrepancies will be found, viz, the variation for 1878 should be —21.3, and for 1890, —22.0, instead of —22.3 and —22.2, respectively, as published in Table XV.—ED.]

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MEXICAN CLIMATOLOGICAL DATA.

Through the kind cooperation of Señor Mariano Bárcena, Director, and Señor José Zendejas, vice-director, of the Central Meteorologico-Magnetic Observatory, the monthly summaries of Mexican data are now communicated in manuscript, in ad-

vance of their publication in the *Boletin Mensual;* an abstract translated into English measures is here given in continuation of the similar tables published in the MONTHLY WEATHER REVIEW during 1896. The barometric means have not been reduced to standard gravity, but this correction will be given at some future date when the pressures are published on our Chart IV.

Mexican data for December, 1897.

Stations.	Altitude.	Mean barometer.	Temperature.			Relative humidity.	Precipitation.	Prevailing direction.	
			Max.	Min.	Mean.			Wind.	Cloud.
	Feet.	*Inch.*	° *F.*	° *F.*	° *F.*	%	*Inch.*		
Arteaga (Coahuila)	.....	.....	83.3	29.7	59.5	.....	0.00	.....	.....
Barousse (Coahuila)	5,414	.....	77.7	32.0	58.3	.....	0.00	.....	.....
Colima (Sem.)	1,656	.....	.....	.....	75.7	.....	.....	.....	.....
Durango	6,241	24.04	78.8	39.2	54.9	51	0.28	sw.	sw.
Leon	5,934	24.32	75.4	27.7	57.9	51	T.	se.	wsw.
Linares (Nuevo Leon)	1,198	29.00	83.3	35.6	56.1	70	0.37	.....	.....
Magdalena (Sonora)	4,948	.....	.....	.....	55.4	.....	0.03	ne.	n.
Merida (Yucatan)	50	30.01	94.5	54.5	74.3	72	0.23	ne.	n.
Mexico (Obs. Cent.)	7,472	23.10	70.7	35.6	55.8	58	0.03	e.	ne.
Monterey	1,626	28.41	84.2	37.2	55.8	63	0.23	e.	ne.
Morelia (Seminario)	6,401	24.40	76.3	39.2	59.2	63	0.12	sw.	w.
Oaxaca	5,164	25.11	82.4	40.1	74.3	60	0.49	w.	ne.
Parros (Coahuila)	3,986	.....	74.8	42.8	59.2	.....	0.71	.....	.....
Puebla (Col. Cat.)	7,112	23.52	75.6	30.7	58.8	52	0.08	ne.	.....
Rosario (Sinaloa)	.....	.....	93.0	21.0	60.3	.....	0.04	sw.	s.
Saltillo (Col. S. Juan)	5,399	24.91	77.2	32.0	55.6	62	T.	s.	n.
San Luis Potosi	6,202	24.30	73.4	35.1	56.8	57	0.06	ne.	w.
Silao (Guanajuato)	6,063	24.32	72.0	39.0	60.8	58	T.	w., sw.	w.
Torreon (Coahuila)	3,720	.....	78.4	37.4	60.8	.....	0.00	.....	.....
Trejo (Guanajuato)	.....	.....	63.5	.....	.....	.....	0.00	w.	.....
Tuxtla (Gutierrez)	1,864	28.06	91.4	51.8	72.9	71	0.00	n.	sse.
Zapotlan (Seminario)	5,078	.....	78.3	44.2	55.2	55	0.00	sse.	sw.

THE ELECTRIC STORMS OF CALIFORNIA.

By J. A. BARWICK, Observer Weather Bureau (dated Sacramento, December 18, 1897).

The electric storms of California are not local to any one portion of the State over another; thunderstorms are observed as occurring on the same day over 800 miles apart, viz, at Picacho, San Diego County, in the southeastern portion of the State, and at Yreka, Siskiyou County, in the northern portion of the State.

During the thunderstorm of August 19, 1896, electric displays were observed in the following counties, beginning in the north and going south, viz, Siskiyou, Modoc, Lassen, Tehama, Sonoma, Alameda, Santa Clara, Mono, San Bernardino, and San Diego counties. Siskiyou and San Diego counties are nearly 800 miles apart.

The greater number of thunderstorms in summer (June, July, and August) are confined mostly to the counties of the Coast Range and the Sierra Nevada range of mountains. Scarcely a day passes in summer but what the tops of thunder-head clouds, such as cumulo-stratus and cumulo-nimbus, may be observed from Sacramento over the Sierra Nevada range of mountains, especially in the northeastern and eastern portions of the horizon. The greater number of these storms are noted in July and August, during and at the closing of a hot spell in the Sacramento and San Joaquin valleys. As the hot and moist-laden air rises it strikes the upper southwesterly current of air and is wafted over the Sierra Nevada Mountains, where the moisture is rapidly condensed, forming these thunder-head clouds. It is among such clouds as these that so much sheet lightning is observed and reported by observers in the foothill and valley towns.

The greater number of these storms are reported as occurring during the months of May, June, July, August, and September; the hotter the weather in summer the greater are the number of such storms observed and reported. The records for 1896 and 1897 show a greater number recorded. Possibly this is due partly to an increased number of observers and to more accurate records of those storms than during previous years, when a much smaller number was reported.

The tabulated data herewith gives a record of all electric storms reported by the voluntary observers throughout the State from September, 1891, to October, 1897, inclusive.

Total number of thunderstorms recorded as having occurred in the State of California from September, 1891, to October, 1897.

Year.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	Total.	Monthly averages.
January	.....	0	1	6	5	7	6	25	4
February	.....	2	0	0	1	4	8	15	3
March	.....	0	4	2	3	3	7	28	5
April	.....	3	2	4	5	9	5	28	5
May	.....	4	7	6	4	13	10	44	7
June	.....	6	0	9	5	11	15	46	8
July	.....	8	8	12	3	25	4	60	10
August	.....	2	0	15	6	18	17	58	10
September	2	8	6	2	7	12	14	51	7
October	1	9	0	1	10	4	5	30	4
November	0	7	3	1	0	0	.....	11	2
December	2	1	6	4	3	1	.....	17	3
Total	*5	59	37	62	53	107	†91	413	88

NOTE.—Total and average for September and October are for seven years. *For four months. †For ten months.

It is true that during cool summers there are much fewer electrical displays than during hot summers with long-continued spells of excessive heat. Had I the time I should be pleased to prepare a chart showing the counties where electric displays were recorded from 1891 to 1897. By such means the points in the State where the greatest number of electric displays are observed would be plainly indicated. No doubt, if our summers in California were as wet and stormy as in the States east of the Rocky Mountains, our record of magnificent electric displays would be equal to those of the East.

In March, 1881, when I took charge of this station, it was reported to me by numerous "oldest inhabitants" that there was no such thing in this State as thunder and lightning. As the same idea had been reported to people in the East, inquiry was made of this office asking if such were the fact. Our records for this station were searched and an article prepared and published in the Monthly Bulletin of the California Weather Service for June, 1893, covering the years from July 1, 1877, to May 17, 1893.

The following are descriptions by the voluntary observers of electric storms of severity that were recorded by them:

September 5, 1891.—Telephones burned out at Pleasanton and Livermore, Alameda County.

June 8, 1892.—Oleta, Amador County, lightning struck a pine tree on the roadside near the village, killing 18 sheep out of a passing band.

September 25, 1892.—Milton, Calaveras County, lightning quite vivid, and was a remarkable and unusual display for this part of the country. Nevada City, Nevada County, September 25, 1892, was the severest and longest ever known to the oldest resident of this section. San Jose, Santa Clara County, the storm of the 25th was the greatest electrical display ever seen by the residents of this city; many young people saw more lightning and heard more thunder than they had ever before observed. Willows, Glenn County, on the evening of the 25th the electric storm in the Sierra Nevada Mountains showed lightning of every kind, visible from this town, from northeast along the entire horizon to the southeast; sometimes for half an hour the lightning was continuous; only a few clouds were visible from this point.

May 12, 1893.—A very sharp thunderstorm passed over Pasadena, Los Angeles County, giving a dozen blinding flashes of lightning; one flash struck the earth within 1,000 feet of the observer and was followed by a tremendous crash. Colegrove, Los Angeles County, on the 12th lightning vivid, several wavy streaks observed in the distant east, which extended horizontally through the clouds at least 15 to 20 miles in length.

May 17, 1893.—Anderson, Shasta County, this storm was the worst that has ever passed over this section; the center appeared to be over Redding, doing some damage by striking the Presbyterian church spire and tearing it away; some two hundred yards away from the church it struck the tree on which the Ruggles brothers were hanged. There were three movements of clouds, one passing along the Coast Range northeast, one along the foothills from the east to the northwest, and one in the center moving northward, all forming over the town of Redding; balls of electricity dropped off the electric wires. It was a grand display, but without much damage.